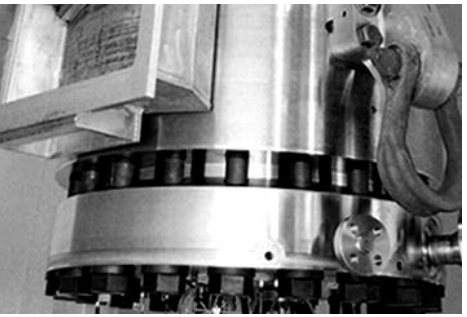
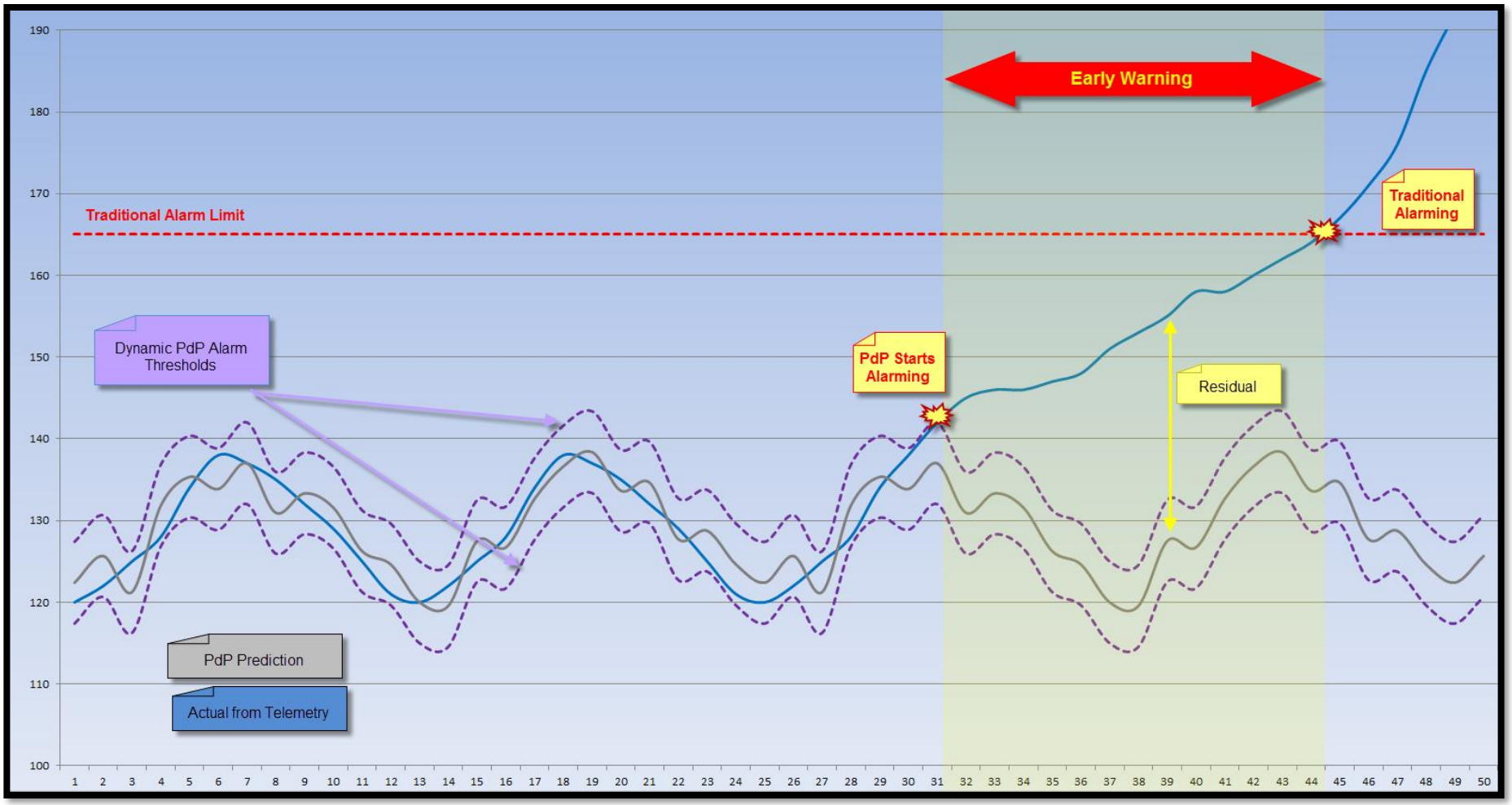
FAMOS PdP Workshop Architect as a Scratchpad



PdP Anomaly Detection



Make reliable predictions and compare with actuals to provide early warning

PdP in Runtime

Current Value

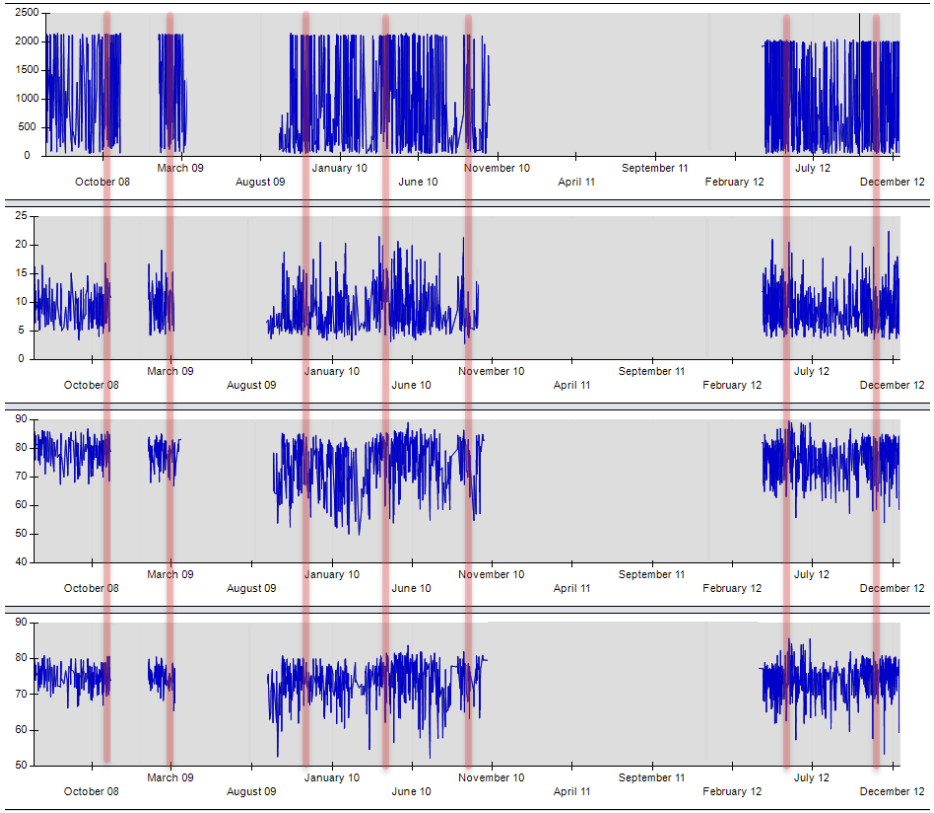
1800

12

82

75

Reference File (Normal Data)



Predicted Value

1810

11.8

82.1

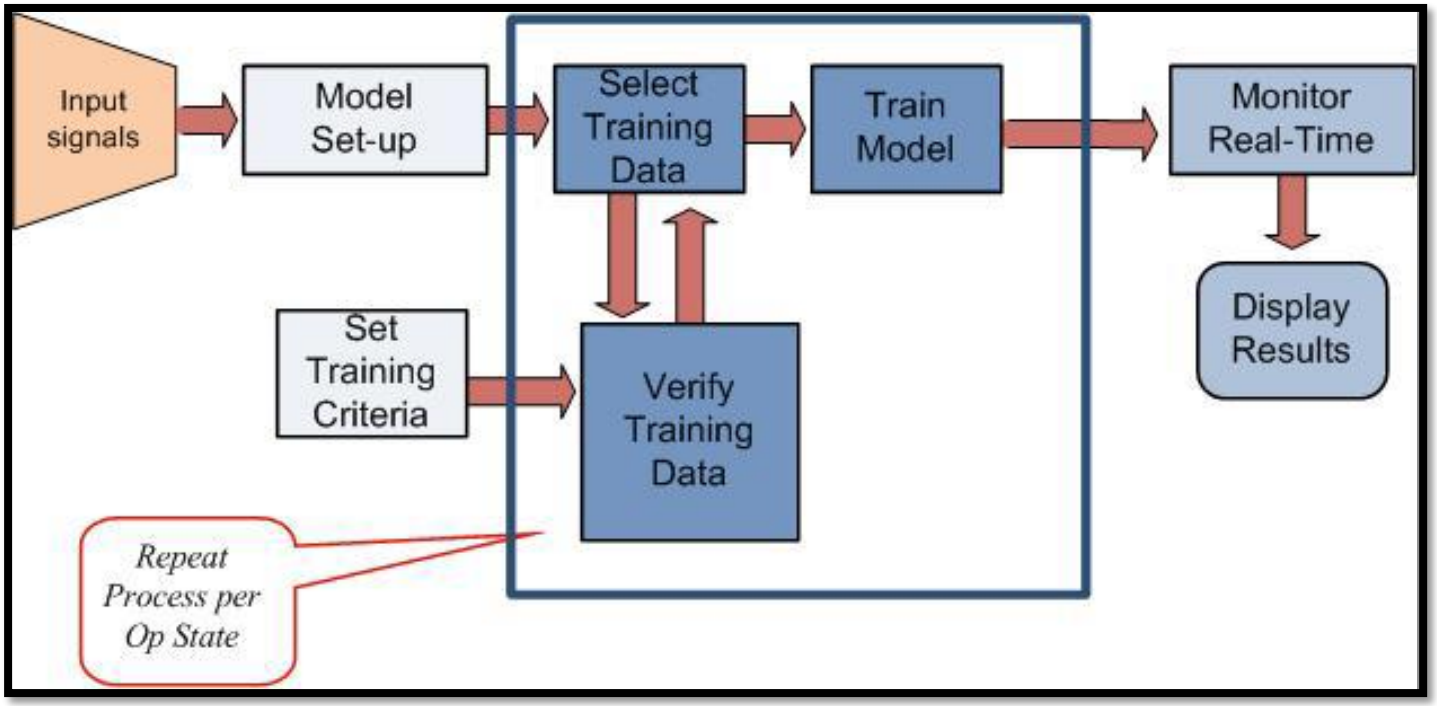
75.3

One Snapshot at a time

Find the most similar snapshots in the normal data regardless of time of year, time of day, previous operating conditions

Weight Average most similar data to predict

PdP Functional Process



Offline

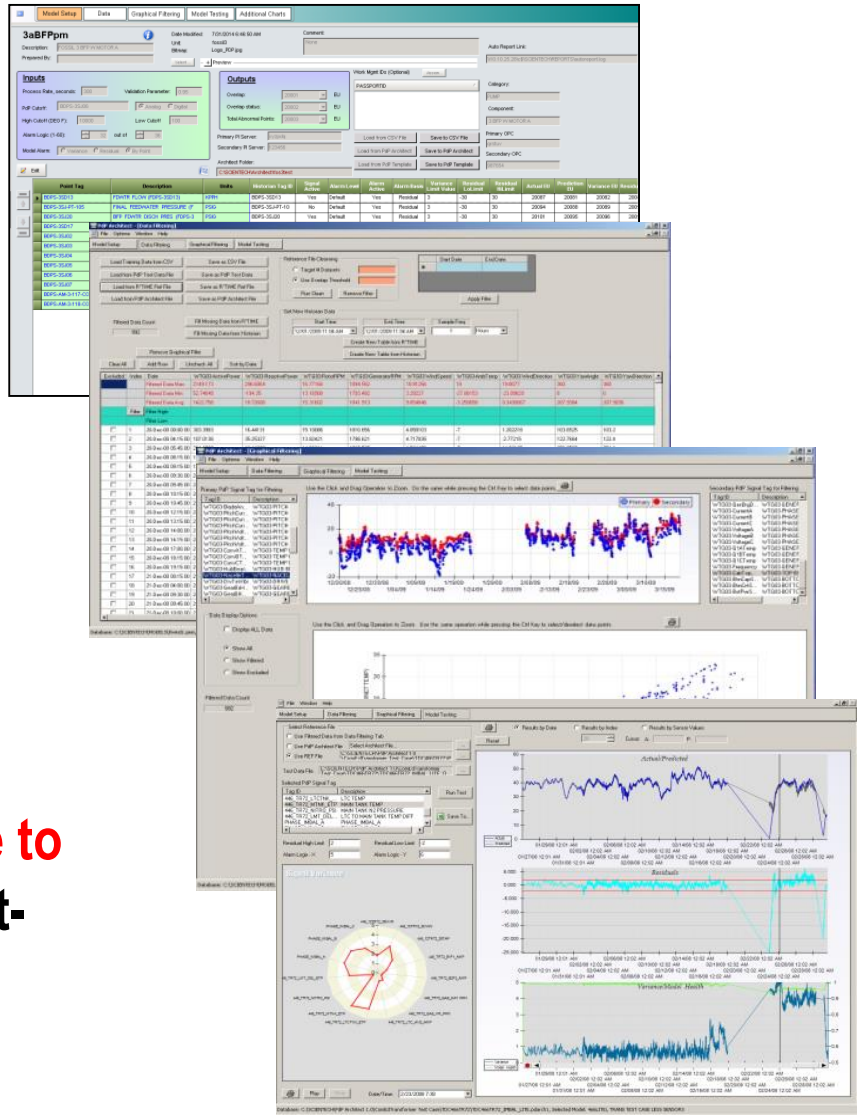
FAMOS ARCHITECT

FAMOS Viewer (Web)
R*TIME VIEWER

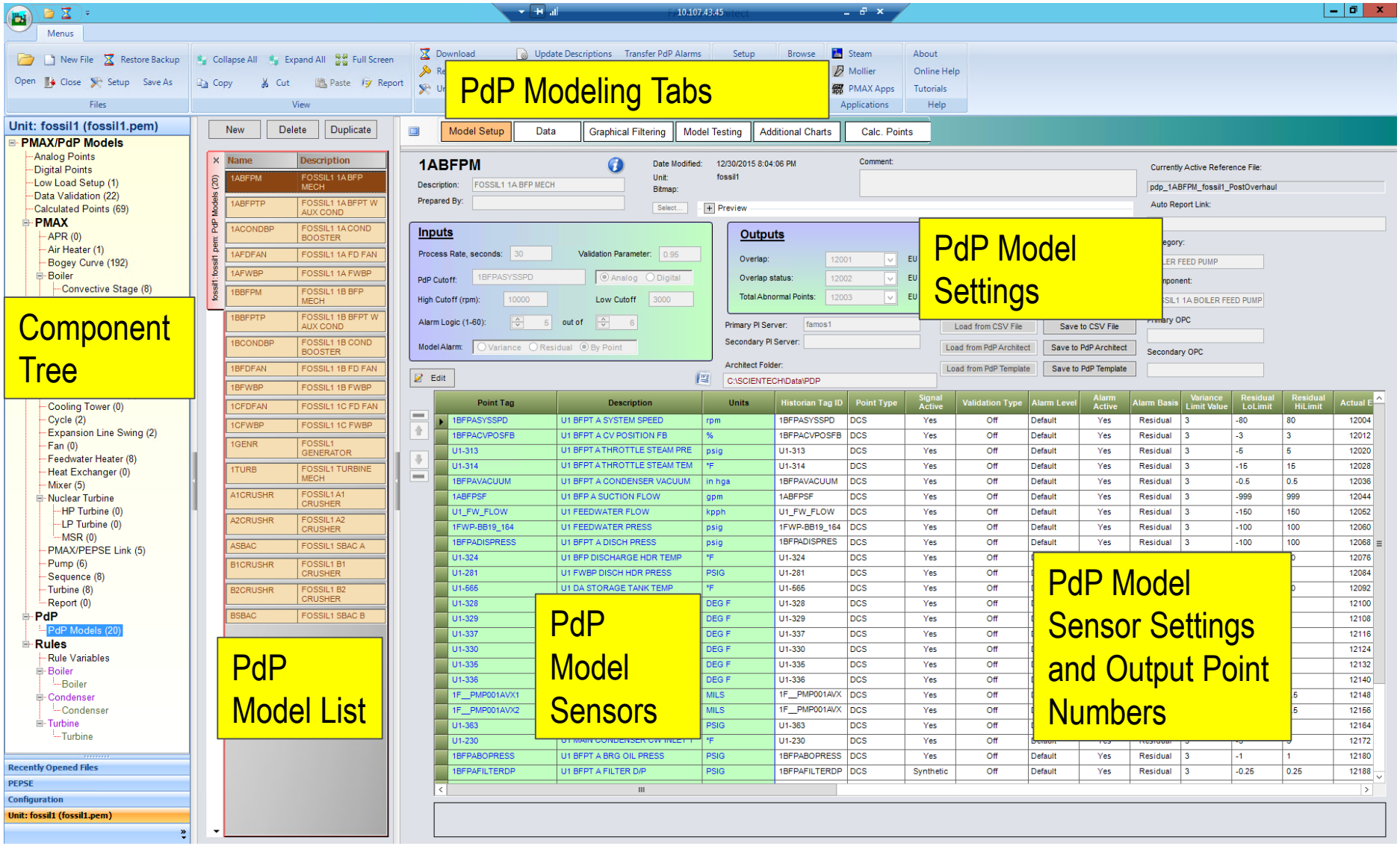
Build, train, test, and maintain

FAMOS Architect – PdP Modeling Functionality

- **Tools for configuring and building models**
  - From scatch (include selection from PI, OPC, FAMOS lists)
  - Copy models within or between databases
  - CSV
  - Store FAMOS data files
  - Spreadsheet-like data manipulation
- **Flexible data import features**
  - FAMOS Historian
  - PI, OPC
  - CSV
  - Store FAMOS data files
- **Data filtering mechanisms; tabular and graphical**
- **Export Data and Test results**
- **Never need to put model in runtime to extract value. Can be used for post-incident review and analysis (RCA) and off-line diagnostics**

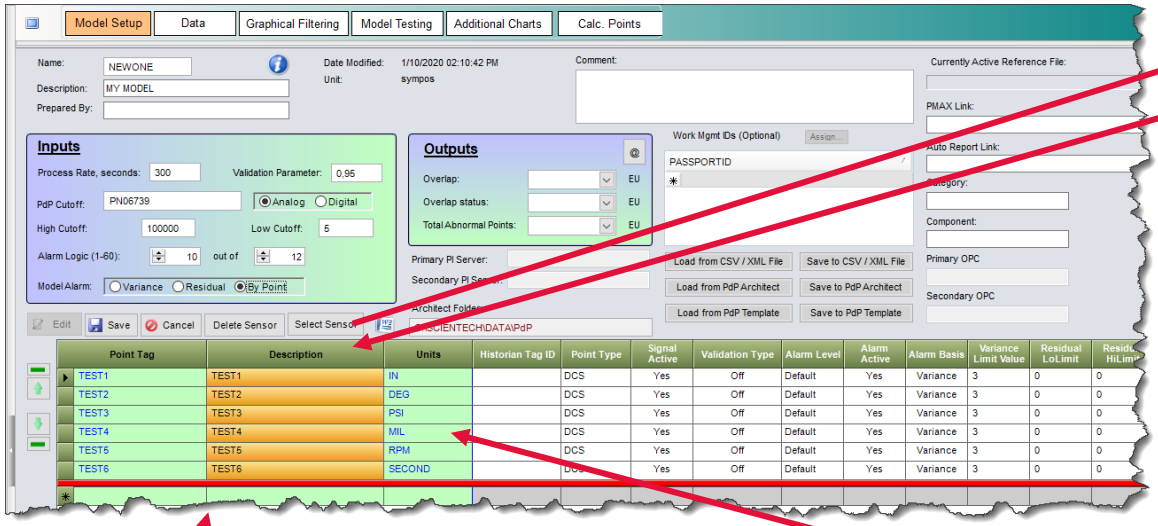


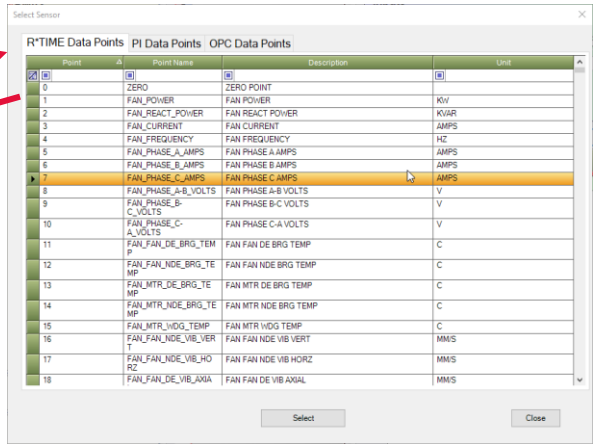
PdP Model Configuration – all from one screen



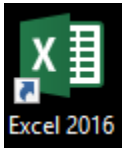
Create or Load a Scratchpad Model

- You can work on a copy of a database (even if you don't currently use PdP)
- You can create a new database from scratch, save it and continually reuse
- Just don't download anything (or run on your own client machine just to be safe)



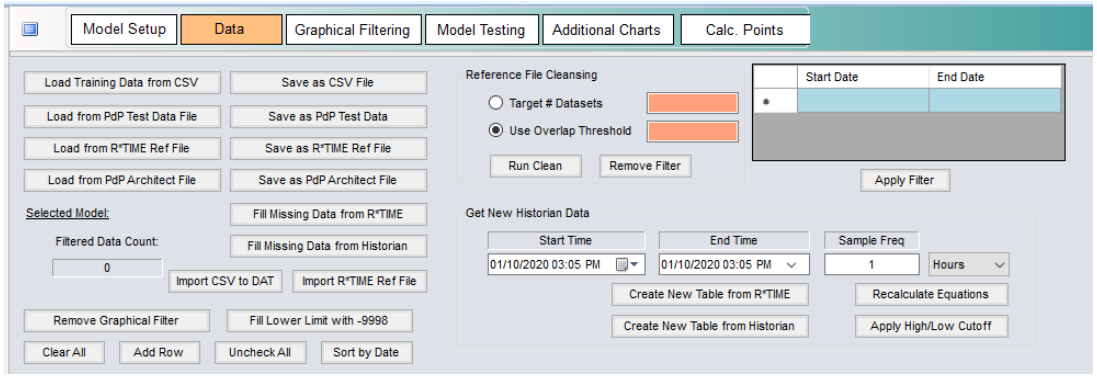


If you have exiting PdP models, you can use them. Or… just build a new one



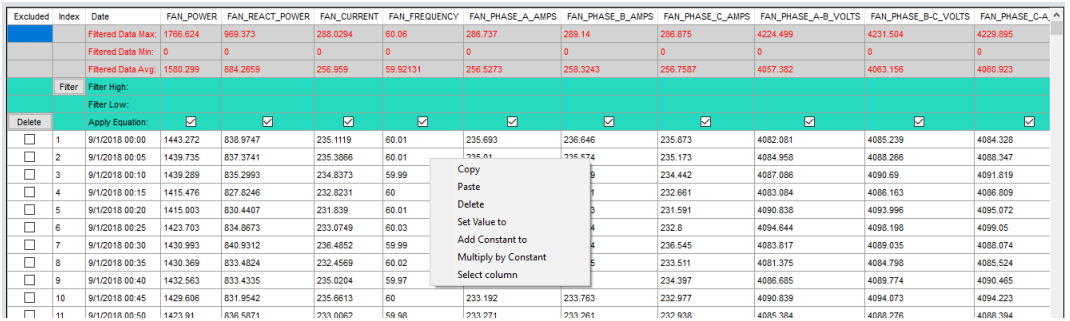
What Can Be Done with the Scratchpad (or real) Model

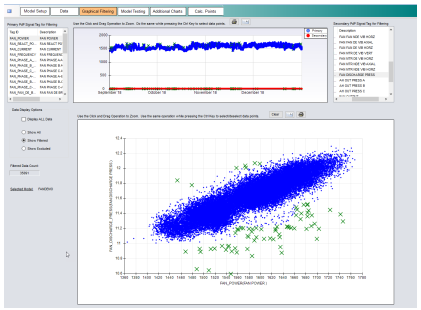
Import Data by Multiple Means



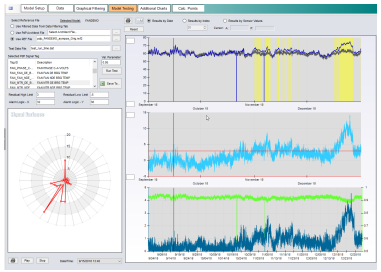
- Fast Downloads of large amounts of data from historians like OSI PI
- Use CSV DATA
- Include Calcs in your model and process after data import

Clean and or Massage the data to suit your needs





Create a reference file and run tests of time periods of interest



Data Wrangling – Tabular Tools

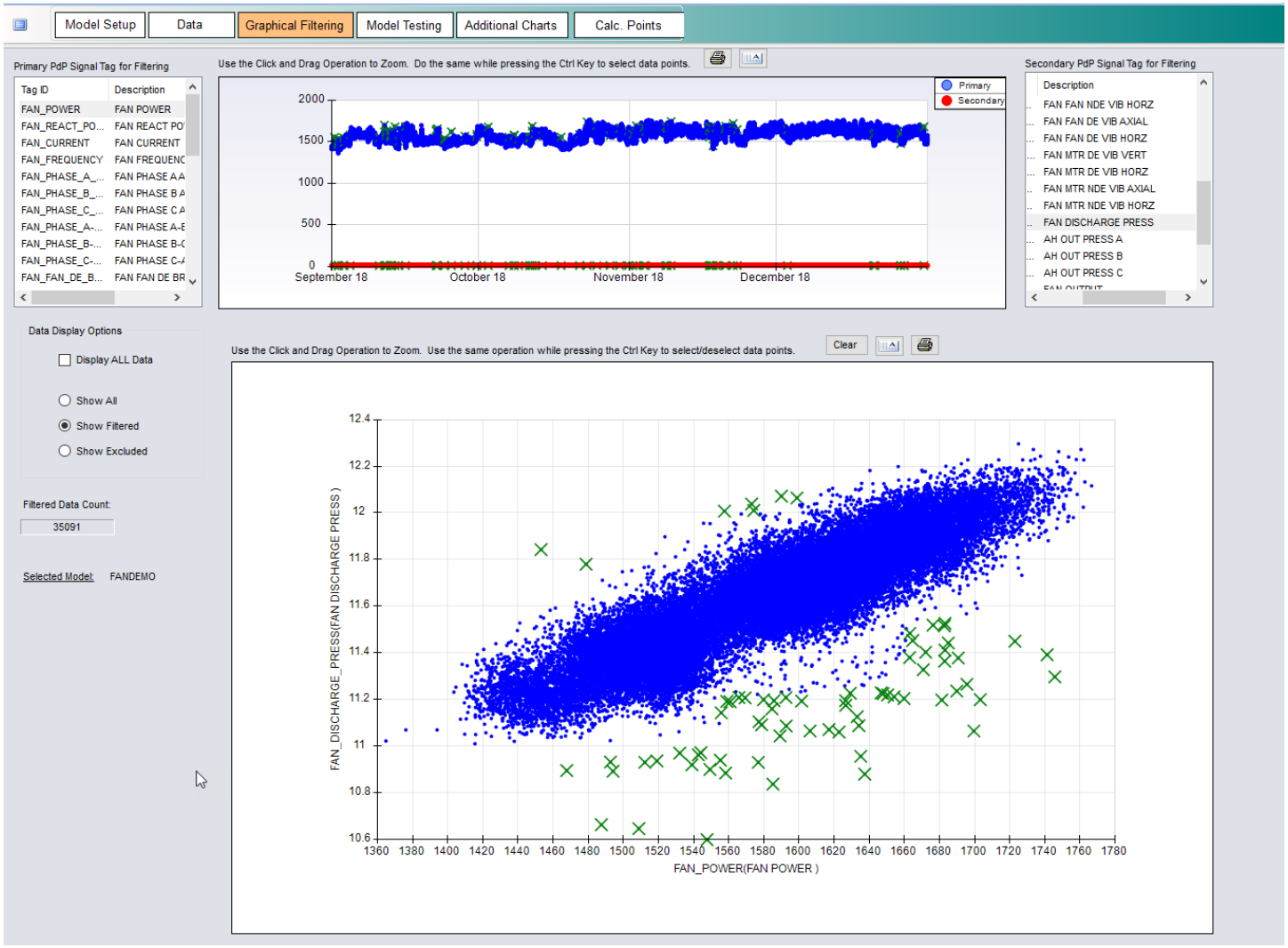
Excluded	Index	Date	I_PHASE_C-A_VOLTS	FAN_FAN_DE_BRG_TEMP	FAN_FAN_NDE_BRG_TEMP	FAN_MTR_DE_BRG_TEMP	FAN_MTR_NDE_BRG_TEMP	FAN_MTR_WDG_TEMP	FAN_FAN_NDE_VIB_VERT	FAN_FAN_NDE_VIB_HORZ	FAI
		Filtered Data Max:	9.895	50.32653	42.75817	75.47301	70.57494	113.7878	1.097112	1.576897	3.18
		Filtered Data Min:	0.309	28.4912	28.12499	54.91943	50.25023	54.06493	0.4741143	0.7877532	0.64
		Filtered Data Avg:	6.118	33.35387	33.31338	62.14423	57.9763	73.85998	0.7108146	1.169303	1.32
	Filter	Filter High:									
		Filter Low:									
Delete		Apply Equation:	☑	☑	☑	☑	☑	☑	☑	☑	
☐	34	9/1/2018 02:45	1.822	46.55761	41.24755	-9999	57.07091	61.17553	0.7006628	1.446922	1.50
☐	35	9/1/2018 02:50	1.077	46.84752	41.30859	-9999	56.99461	6		1.404911	1.65
☐	36	9/1/2018 02:55	7.475	46.69494	41.30859	-9999	56.93359	6		1.314963	1.52
☐	37	9/1/2018 03:00	6.414	46.84752	41.24755	-9999	56.99461	6		1.284309	1.39
☐	38	9/1/2018 03:05	9.856	46.19139	41.24755	-9999	56.79625	6		1.272328	1.40
☐	39	9/1/2018 03:10	0.402	46.09985	41.30859	-9999	56.85729	6		1.238901	1.41
☐	40	9/1/2018 03:15	4.912	46.13036	41.24755	-9999	56.78099	6		1.198524	1.38
☐	41	9/1/2018 03:20	5.943	46.03881	41.40014	-9999	56.78099	6		1.180302	1.35
☐	42	9/1/2018 03:25	3.84	46.26769	41.38488	-9999	56.71996	60		1.169028	1.44
☐	43	9/1/2018 03:30	3.951	46.26769	41.38488	-9999	56.64367	60.33629	0.6293832	1.15436	1.54
☐	44	9/1/2018 03:35	2.268	46.6339	41.38488	-9999	56.64367	60.50414	0.6439853	1.22539	1.58
☐	45	9/1/2018 03:40	6.211	46.71019	41.46117	-9999	56.56737	60.36681	0.6433493	1.269626	1.62
☐	46	9/1/2018 03:45	7.294	46.90856	41.46117	-9999	56.50633	60.01586	0.6408206	1.305558	1.50
☐	47	9/1/2018 03:50	3.126	46.20666	41.38488	-9999	56.44531	60.0769	0.6602103	1.289871	1.37
☐	48	9/1/2018 03:55	3.636	45.68786	41.36962	-9999	56.43005	60.06163	0.6823921	1.257742	1.36
☐	49	9/1/2018 04:00	7.201	46.03881	41.38488	-9999	56.35375	60.12267	0.6562873	1.218974	1.36
☐	50	9/1/2018 04:05	9.13	45.90148	41.38488	-9999	56.33849	59.93956	0.6240941	1.177931	1.40
☐	51	9/1/2018 04:10	6.898	45.70311	41.38488	-9999	56.27746	60.09216	0.6856959	1.150863	1.44
☐	52	9/1/2018 04:15	5.022	45.10802	41.32384	-9999	56.35375	60.24474	0.7591657	1.128109	1.42
☐	53	9/1/2018 04:20	7.111	45.68786	41.38488	-9999	56.35375	60.36681	0.7609366	1.18365	1.40
☐	54	9/1/2018 04:25	9.785	44.77233	41.40014	-9999	56.27746	60.71776	0.7538191	1.264269	1.63

Copy
Paste
Delete
Set Value to
Add Constant to
Multiply by Constant
Select column

- Simple tools to address whole columns or ranges of data
- Copy and paste to and from a spreadsheet
- Fill in Missing Data by creating a reference file for periods when all the sensor data is normal and use to predict data for periods when select sensors were bad

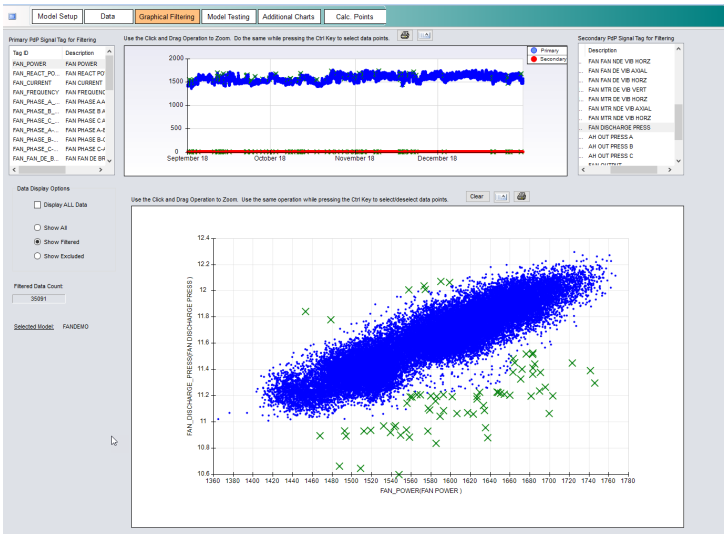
Data Wrangling

Graphical Tools

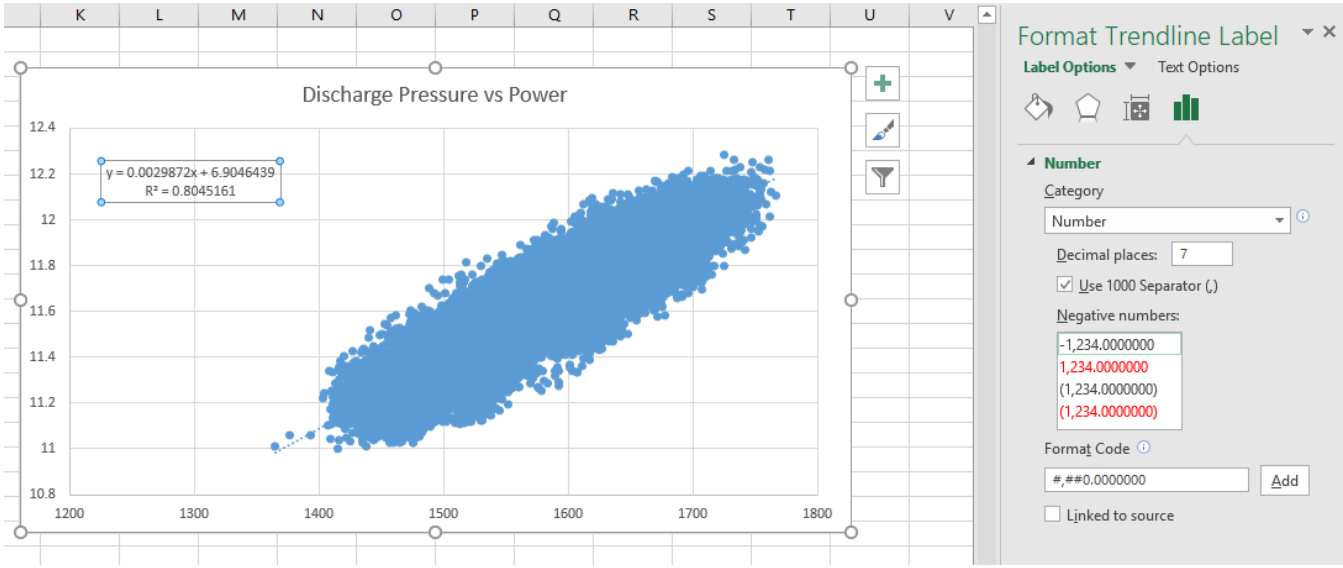


- Temporarily highlight data to match time of occurrence to x-y relationship to assess outlier or clusters
- Mark datapoints to be excluded when data is saved
- No data is discarded until the data is saved

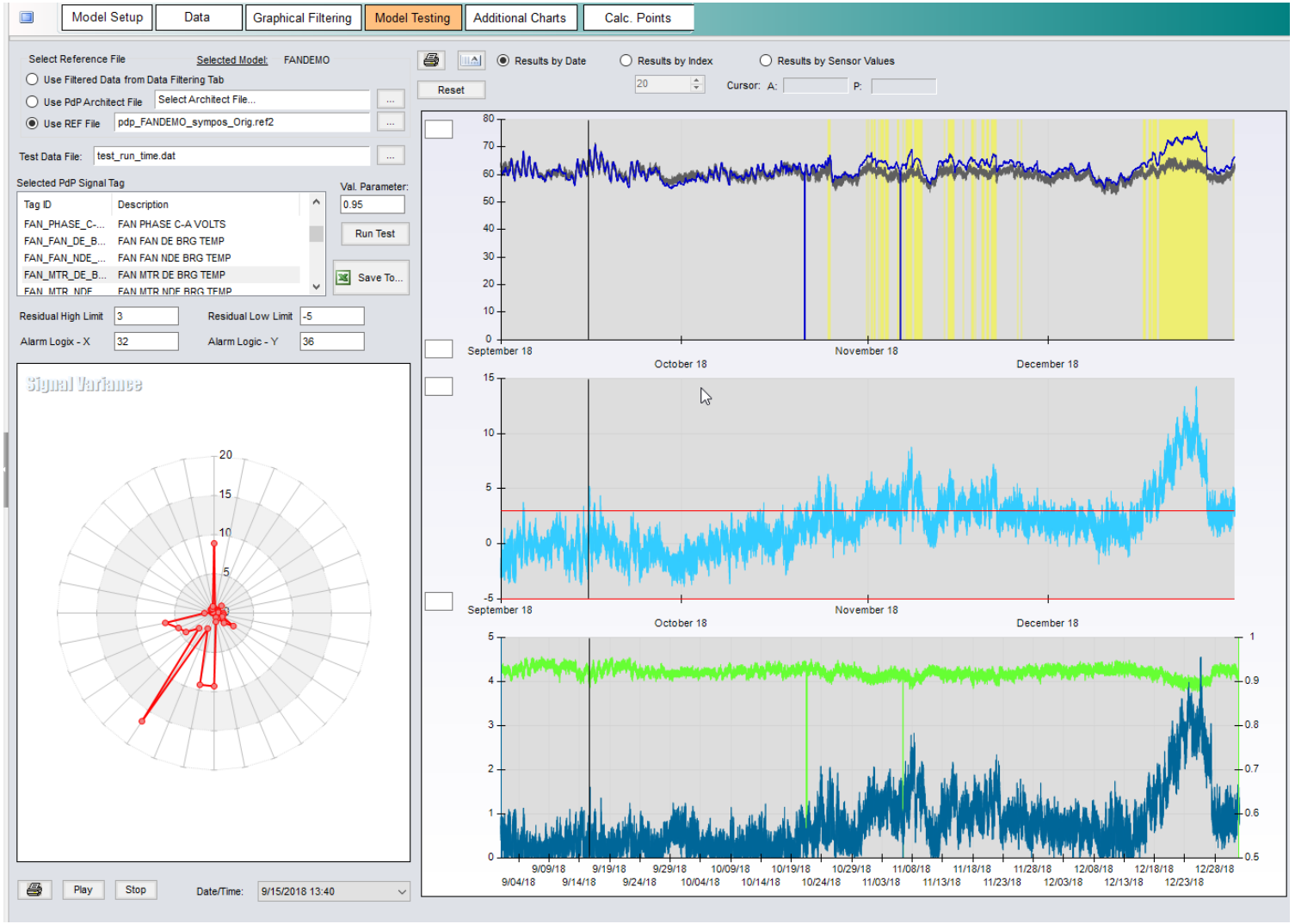
Simple Use - Clean Data to Use in Curve Fitting



Be careful of number formatting in equations provided in Excel … make sure to format to get enough significant figures

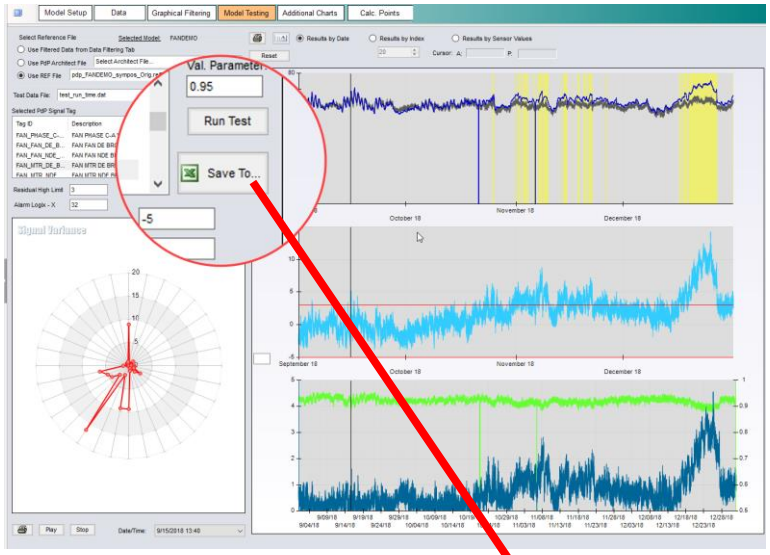


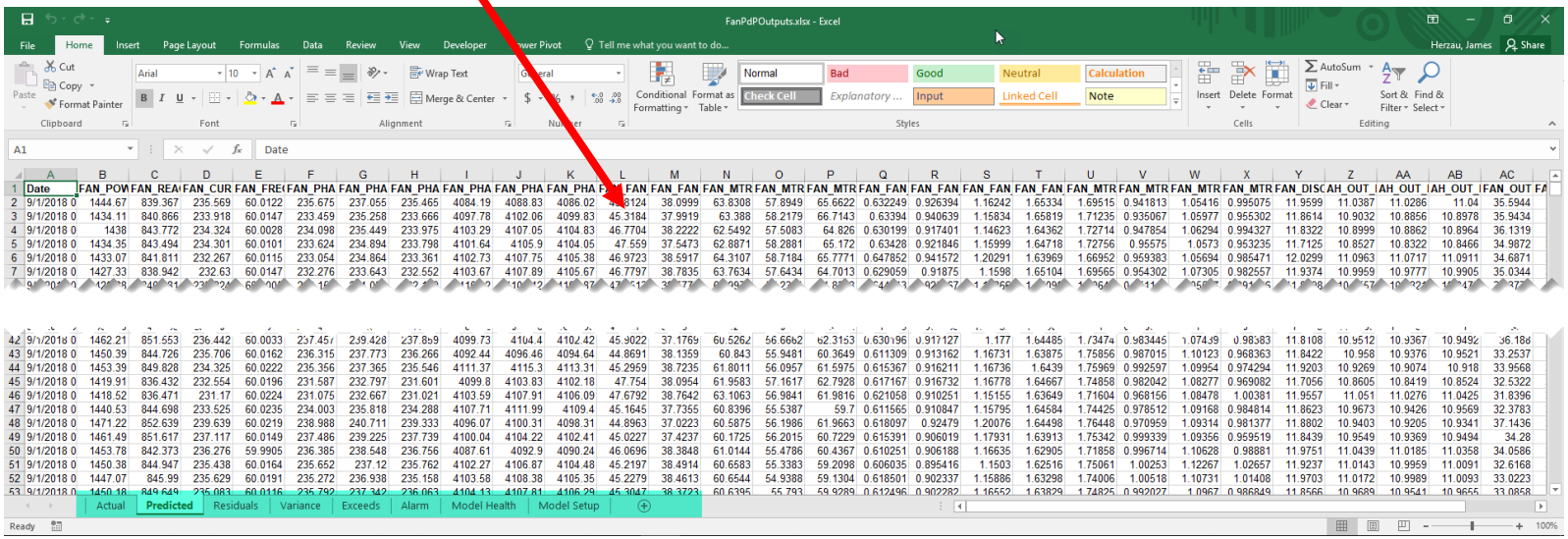
Root Cause Analysis or Near Real Time Troubleshooting



Multiple Synchronized Charts

PdP Model Configuration – all from one screen





Summary

- PdP is an integral part of FAMOS
- You can realize value from PdP Functionality even if you don't run models in real time
- Creating usable data can be a significant effort
- FAMOS Architect PdP tools can make creating usable data more manageable

Questions

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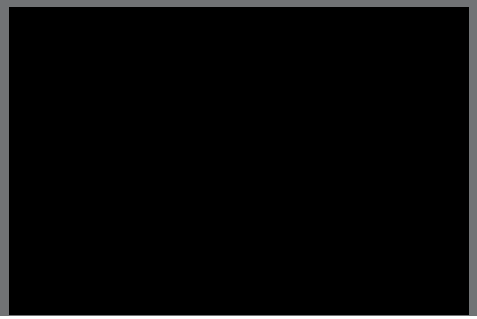
jherzau@curtisswright.com



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